

REMARKS

Claims 1-70 are pending. Claims 66-70 are new. Claims 1-7, 15, 17, 18, and 33-65 have been withdrawn from consideration. Unless otherwise mentioned herein, paragraph numbers refer to the specification as published as US 2004/0152122.

Support for the amendments to claims 8 and 26 and new claims 66-70 can be found throughout the specification including the Drawings and claims as filed originally. Particular support for each claim amendment and new claim is outlined below.

More particular support for recitation of the first and second heat sources in amended claim 8 can be found, for instance, in Fig. 1, Fig. 2a and Fig. 2b. See also ¶¶ [0058], [0059] [0063] and [0065] from Applicants' specification (disclosing, among other things, two heat sources (3) and (4) that supply heat to or remove heat from sample).

Claim 26 has been amended as a matter of form and claim clarity.

New claims 66-67 (both dependent from claim 8) find specific support in Fig. 1 of Applicants' specification which shows, among other things, a reaction vessel that includes a single fluid passage between a high temperature region (1) and lower temperature region (2). Both an upward and downward convective flow are shown through a single fluid passage. See Fig. 1 (arrows). Additional support can be found at ¶¶ [0063] and [0064].

New claim 68 (dependent from claim 8) is specifically supported by Fig. 1 which shows, among other things, a vertical gap positioned between the high (1) and low (2) temperature regions. As illustrated, the vertical gap features the convection region (5).

New independent claim 69 was written along lines of claim 8 (as previously presented) except that the reaction vessel is configured "so as to have a single passage between a relatively high temperature region and a relatively low temperature region". Specific support for this language has already been mentioned.

New independent claim 70 was also drafted along lines of claim 8 (as previously presented) except that in the second paragraph following the claim preamble, "the heat sources [are] further arranged to produce a vertical gap between the top of the relatively high temperature

region and the bottom of the relatively low temperature region”. Particular support for this language has already been discussed.

No new matter has been added by virtue of the claim amendments or new claims.

Request for an in-person interview

Applicants respectfully request an interview with the Examiner after the Office has considered the present RCE submission but before any action on the merits. Applicants thank the Examiner in advance for this courtesy. The undersigned will contact the Office to arrange the interview.

Applicants now address concerns raised in the Office Action in the order in which they appear in that paper.

Priority Under 35 USC §119

On October 26, 2007, Applicants submitted certified copies of Korean Application Nos. 10-2001-57040 and 10-2001-66943 (as filed on September 15, 2001 and October 30, 2001, respectively) along with corresponding English translations. It is respectfully requested that the USPTO acknowledge Applicants’ priority claims to these priority applications in the next office action.

Pending claims 1-70 find abundant support throughout the disclosure of PCT/KR02/01728 as filed on September 14, 2002 which PCT application is the parent of the instant application. The pending claims find additional support throughout the disclosures of Korean priority application Nos. 10-2001-57040 and 10-2001-66943 (as filed on September 15, 2001 and October 30, 2001, respectively).

Referring now to the English translation of Korean priority application 10-2001-57040 (Korean ‘040 application), claim 8 as presently amended finds particular support in prior claim 8 as filed in the Korean ‘040 application (see pgs. 25-26, bridging paragraph). Further support in the translation of the priority document can be found in Figure 1, Figure 2b and Figure 2c. These figures are essentially the same as corresponding figures having the same number in the instant case. Figure 1, for instance, from the Korean ‘040 application shows a preferred heat source

arrangement in which two heat sources (3) and (4) are shown. See also the supporting disclosure at pg. 12, line 13 to pg. 13.

Pending claims 9-14, for instance, find specific support in claims having the same number in the Korean '040 priority application.

Pending claims 19-32, for instance, find particular support in the disclosure beginning at pg. 15, first full paragraph, to pg. 19. Further support is provided by the Examples section.

Newly added claims 66-70 find particular support in the Korean '040 application as described above.

In view thereof, Applicants respectfully request that the Office acknowledge priority for all the pending claims to the PCT/KR02/01728 application and Korean priority application Nos. 10-2001-57040 and 10-2001-66943.

Claim Objection

The Examiner objected to claim 27 for lacking a period. The objection has been addressed by this submission. Reconsideration and withdrawal of the objection are requested.

The paragraph numbers below correspond to those set forth in the instant Action.

8. Applicants' rebuttal to Office response to arguments re 103 rejections of claims 8-9 and 19-20 over Hunicke-Smith (WO 97/48818) in view of Benett et al. (WO 02/072267).

Claims 8-9 and 19-20 stand rejected over Hunicke-Smith in view of Benett. On pgs. 4-6 of the instant Action, the Office advanced arguments against Applicants' position that the claims were patentable over the references cited. Below, Applicants respectfully rebut each argument set forth by the Office in support of the outstanding obviousness rejection of the claims.

A. On pg. 4 of the instant Action, the Office maintained its position that Benett "specifically teach[es an] upper temperature zone located lower in height than a relatively low temperature zone". Applicants respectfully disagree for reasons of record. In particular, it is not seen how one reading Benett could have this understanding when the reference plainly discloses that the upper temperature zone overlaps in its vertical position with the lower temperature zone.

See Fig. 1, for instance (showing, among other things, vertical overlap between the high temperature zone 13 and the low temperature zone 14). As one reading Benett would appreciate, none of Benett's temperature zones can be "lower in height" than another when the document teaches that zones overlap vertically.

Also on pg. 4 of the instant Action, the Office alleged that "there is no limitation in the claims that the zones do not overlap". Applicants respectfully submit that they should not be required to amend pending claims before questioning basis for citing Benett against the pending claims. The upper and lower temperature zones of Benett are taught to overlap in their vertical positions. See Fig. 1, for instance. The reference does not teach, specifically or otherwise, that one zone is lower or higher than the other.

Accordingly, the Office has not made a *prima facie* case to the extent the outstanding rejection relies on Benett teaching "an upper temperature zone located lower in height than a relatively low temperature zone". The Office is respectfully requested to reconsider and withdraw the rejection.

B. Also on pg. 4, the Office took the position that Hunicke-Smith "actually uses capillary as reaction vessels and thus indeed does teach 'straight cylinder or tube' (see Hunicke-Smith page 2 line 9, where capillary tube is taught)". Notwithstanding this information, there is no disclosure in the reference that shows how a worker would substitute Hunicke-Smith's capillary with any part or all of the reaction chamber taught by Benett. Benett specifically mentions "creating a convection cell or 'convection siphon' in his multi-channel cell. See pg. 5, lines 16-22, for instance. It is not seen how that disclosure is compatible with any capillary taught by Hunicke-Smith.

For reasons of record, a worker would be dissuaded from combining Hunicke-Smith and Benett in the way suggested by the Office at pg. 4 of the Action, ¶ 4. According to the Office, the resulting device includes a capillary as taught by Hunicke-Smith. However, it is not seen how that device could function as a convection cell with siphonic fluid flow as taught by Benett (see pg. 5 of Benett, lines 21-22 and Fig. 1, for instance). That is, the device suggested by the Office would be inoperable.

Accordingly, the Office has not made a *prima facie* case to the extent the outstanding rejection relies on substituting the capillary taught by Hunicke-Smith for part or all of Benett's convection cell. The Office is respectfully requested to reconsider and withdraw the rejection.

C. On pgs. 4-5, bridging paragraph, the Office took the position that the "tops part of both the channels (12a and 12b) is subjected to lower temperature and bottom part of both the channels (12a and 12b) is subjected to higher temperature." To the extent the rejection relies on this reading of Benett, it cannot stand. For example, Benett specifically discloses that heater 15 is used to heat the upper temperature zone 13 (only channel 12a). See pg. 5 and Fig. 1 of Benett. The heating configuration urged by the Office is simply not disclosed or suggested by Benett as cited.

Further, Benett discloses trenches 19 used for thermal isolation. See Benett at pg. 6, lines 7-8 and Fig. 2, for instance. As disclosed, heat is drawn passively away from essentially all of channels 12a, 12b, 12c, and 12d to the trenches 19. Heat flow between the channels 12a, 12b, 12c, and 12d is thus essentially blocked. Therefore, the Office position that the "tops part of both the channels (12a and 12b) are subjected to lower temperature and bottom part of both the channels (12a and 12b) is subjected to higher temperature" is not correct. Instead, each of channels 12a, 12b, 12c, and 12d is essentially thermally isolated from each other because of the trenches 19. This arrangement thus allows the upper and lower temperature zones to be formed independently in the channels 12a and 12c as specifically disclosed in Fig. 1 of Benett.

Accordingly, the Office has not made a *prima facie* case to the extent the outstanding rejection relies on the view that the "tops part of both the channels (12a and 12b) is subjected to lower temperature and bottom part of both the channels (12a and 12b) is subjected to higher temperature." Reconsideration and withdrawal therefore are requested.

D. On pg. 5 of the Action, the Office took the position that Applicants erroneously concluded that Benett teaches unidirectional flow. Applicants respectfully disagree for reasons of record and as follows.

For example, Benett discloses that flow in his chamber moves in one direction (see the arrows provided in Figure 1 and the disclosure at pg. 5, line 25 to pg. 6, line 2, for instance). The

Examiner's argument cannot withstand scrutiny in the face of what the cited reference itself teaches. To the extent any bidirectional flow could occur in Benett's device, it would impede or block the convective siphon action taught throughout the cited reference. See for example Fig. 1 and pg. 5 of Benett.

Applicants respectfully disagree with the position that "[Benett's convection] flow is *inherently* bidirectional." Action at pg. 5 (italics added). The position cannot withstand scrutiny in view of MPEP requirements for rejecting claims based on inherency grounds.

For instance, MPEP 2112, Section IV states that:

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic (citing *In re Rijckaert*, 9 F.3d 1531, 28 USPQ 1955 1957 (Fed. Cir. 1993) and *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981).

To establish inherency, the extrinsic evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities.

In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art (citing *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

It is submitted that the Office has not satisfied these requirements. As cited, Benett shows that fluid moves in one direction (see the arrows in Fig. 1, for instance). One of skill would understand from Benett that fluid moves in one direction. The Examiner has offered no solid evidence to refute what the reference plainly discloses i.e., that fluid flows through Benett's device in one direction. Bidirectional flow, to the extent it exists at all within Benett's convection cell, would impede or block the siphonic flow taught by the document (see pg. 5 of Benett at lines 21-22, for instance).

Accordingly, the Office has not satisfied the USPTO requirements for substantiating a claim rejection on inherency grounds. MPEP 2112, section IV. No *prima facie* case can withstand scrutiny to the extent it relies on the position that Benett "inherently" teaches bidirectional fluid flow.

In view thereof, Applicants respectfully submit that they have rebutted all the Office grounds for rejecting claims 8-9 and 19-20 as set forth on pgs. 4-6 of the instant Action. Reconsideration therefore is requested.

Claim amendments and new claims

Applicants believe amended claim 8 and claims dependent therefrom are particularly distinguishable over the cited references including Hunicke-Smith and Benett.

In particular, at pgs. 10-11 of the instant Action, bridging paragraph, the Office took the position that: (*italics in the original, bold added by Applicants*):

[r]egarding claim 8 **Hunicke-Smith does not teach spatial temperature distribution therefore following elements related to spatial temperature distribution in the claim are not taught by Hunicke-Smith:** *a plurality of specific regions in a sample contained in a reaction vessel, wherein the **heat sources** are arranged to maintain a specific spatial temperature distribution in the sample such that a relatively high temperature region is located lower in height than a relatively low temperature region.*

, and wherein the specific spatial temperature distribution is a temperature distribution that induces circulation of the sample by thermal convection so that the denaturation, annealing, polymerization steps occur sequentially and repeatedly inside the sample.

Claim 8, as presently amended, further defines the **heat source** elements that relate to the spatial temperature distribution. That is, amended claim 8 now features a **first heat source** element that provides heat to a lower portion of the sample. The first heat source is further defined as being **located lower in height** than a **second heat source**. The **second heat source** element is defined as removing heat from an upper portion of the sample. Both the newly recited first and second heat sources are elements of spatial temperature distribution. Neither heat source element, nor the spatial relationship between them are taught by Hunicke-Smith. As elements of the spatial temperature distribution, the heat sources cannot be taught by Hunicke-Smith (see Action at pgs. 10-11, bridging paragraph and the caption above).

Benett cannot remedy this defect. For instance, the reference as cited specifically discloses a single heat source (15) for its closed loop cell. See Benett at pg. 5 and Fig. 1. No heat source for removing heat from sample is provided anywhere in the reference. See Benett at pg. 6, lines 21-22; pg. 6, lines 23-24; pg. 8, lines 22-23, for example. Moreover, and in marked contrast to Applicants' invention, Benett urges "passive cooling" of his cell. See Benett at pg. 6,

lines 21-22, Fig. 2, for example. Nowhere does Benett as cited provide for a second heat source that removes heat from any part of his device or sample. Nowhere does the reference provide or suggest how to achieve a spatial temperature distribution in which a first heat source providing heat to a lower portion of the sample is located lower in height than a second heat source removing heat from an upper portion of the sample. None of the other references of record remedy this defect.

Accordingly, it is respectfully requested that the Office reconsider and withdraw the outstanding rejection of claim 8 over Hunicke-Smith and Benett.

Amended dependent claim 26 is further distinguishable from the cited references on grounds that none of the references taken individually or together provides for a heat source arrangement in which the spatial temperature distribution includes a convection region positioned between the relatively high and relatively low temperature regions within the straight cylinder or tube reaction vessel. As the specification makes clear, the convection region is a region in which both an upward and downward convective flow occur. See paragraphs [0064] and [0078], for instance.

New dependent claims 66 and 67 are also distinguishable over the cited references. For example, none of them provide for a straight cylinder or tube that is configured to have a single passage between the relatively high temperature region and the relatively low temperature region. In particular, new claim 67 provides for “a single passage for both an upward and downward convective flow”.

New dependent claim 68 is also distinguishable over the references as relied on. None of them disclose or suggest an arrangement of heat sources in which a vertical gap is produced between the top of the relatively high temperature region and the bottom of the relatively low temperature region.

New independent claims 69 and 70 are also distinguishable in view of the Examiner’s combination of cited references for reasons already mentioned.

9. Double-patenting Rejection

At pg. 14 of the non-final office action dated September 6, 2006, claims 8, 16, and 20 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 7 and 8 of co-pending patent application Ser. No. 10/836,376. The provisional rejection has been maintained in the present Action at pg. 6. As the rejection is provisional, Applicants will address the rejection if patent application Ser. No. 10/836,376 is granted prior to the instant application and the claims of the instant application are otherwise in condition for allowance.

12. Rejection of claims 8-9, 19-22, 25-27 under 35 USC 103(a) over Hunicke-Smith (WO 97/48818) in view of Benett et al. (WO 02/072267).

Applicants respectfully disagree with the stated reasons for rejecting claims 8-9, 19-22, 25-27. However, basis for the rejection has been addressed by this submission.

In particular, the shortcomings of Hunicke-Smith and Benett have already been discussed, particularly in reference to amended claim 8 (from which the rejected claims all depend). None of the cited references taken individually or together teach or suggest a nucleic acid amplification apparatus in which a plurality of heat sources includes a first heat source that provides heat to a lower portion of sample and is located lower in height than a second heat source for removing heat from an upper portion of the sample.

The Office indicated at pg. 12 of the rejection that claim 26 was not considered. Applicants respectfully request full consideration of amended claim 26 on the merits.

Accordingly, reconsideration and withdrawal of the rejection are requested.

13. Rejection of claims 10-12, 14, and 23 under 35 USC 103(a) over Hunicke-Smith (WO 97/48818) and Benett et al. (WO 02/072267) and further in view of Haff et al. US Pat. 5,720,923.

Applicants respectfully disagree with the stated reasons for rejecting the claims. However, basis for the rejection has already been addressed by this submission.

In particular, the shortcomings of Hunicke-Smith and Benett have already been discussed, particularly in reference to amended claim 8 (from which the rejected claims all depend). The

citation of Haff does not remedy these defects. Accordingly, reconsideration and withdrawal of the claim rejections are requested.

14. Rejection of claims 24 and 28-30 under 35 USC 103(a) over Hunicke-Smith (WO 97/48818) Bennett et al. (WO 02/072267), and Haff et al. US Pat. 5,720,923 and further in view of Bedingham et al. US Pat. 5,720,923.

Applicants respectfully disagree with the stated reasons for rejecting the claims. However, basis for the rejection has already been addressed by this submission.

In particular, the shortcomings of Hunicke-Smith and Bennett have already been discussed, particularly in reference to amended claim 8 (from which the rejected claims all depend). The citation of the Haff and Bedingham patents does not remedy these defects. Accordingly, reconsideration and withdrawal of the claim rejections are requested.

15. Rejection of claim 13 under 35 USC 103(a) over Hunicke-Smith (WO 97/48818) and Bennett et al. (WO 02/072267) and further in view of Northup WO 98/25701.

Applicants respectfully disagree with the stated reasons for rejecting the claims. However, basis for the rejection has already been addressed by this submission.

In particular, the shortcomings of Hunicke-Smith and Bennett have already been discussed, particularly in reference to amended claim 8 (from which the rejected claims all depend). The citation of Northup does not remedy these defects. Accordingly, reconsideration and withdrawal of the claim rejections are requested.

16. Rejection of claims 16 and 31 under 35 USC 103(a) over Hunicke-Smith (WO 97/48818) and Bennett et al. (WO 02/072267) and further in view of Macho et al. U.S Pat. No. 5, 919,622.

Applicants respectfully disagree with the stated reasons for rejecting the claims. However, basis for the rejection has already been addressed by this submission.

In particular, the shortcomings of Hunicke-Smith and Bennett have already been discussed, particularly in reference to amended claim 8 (from which the rejected claims all depend). The citation of Macho does not remedy these defects. Accordingly, reconsideration and withdrawal are requested.

17. Double-patenting- The provisional rejection has been addressed above.

Conclusion

Applicants believe that no further fee is due to consider the present amendment. Nevertheless, the Director is hereby authorized to charge or credit any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. **502486**.

Dated: October 31, 2007

Respectfully submitted,

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